



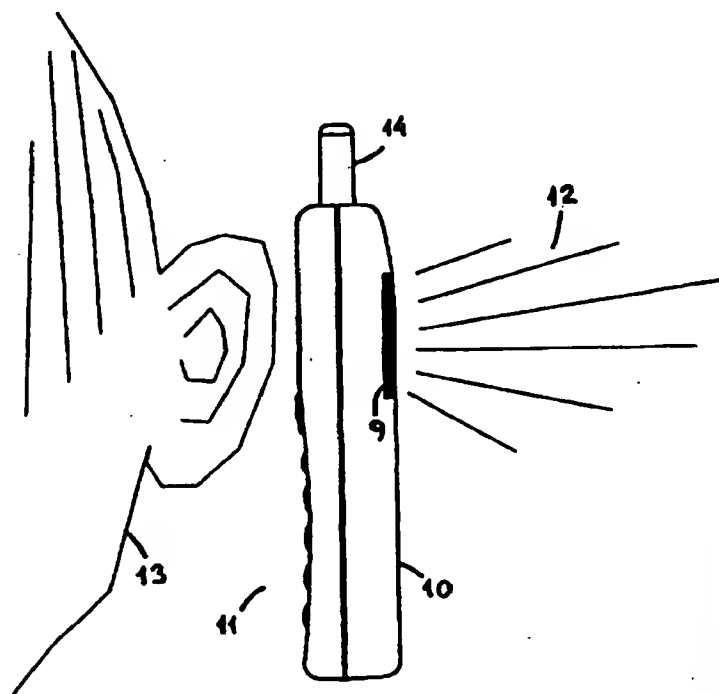
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(21) International Application Number: PCT/DK97/00295 (22) International Filing Date: 4 July 1997 (04.07.97) (30) Priority Data: 0742/96 5 July 1996 (05.07.96) DK (71) Applicant (for all designated States except US): DANCALL TELECOM A/S [DK/DK]; Klokkestøbervej 4, DK-9490 Pandrup (DK). (72) Inventor; and (75) Inventor/Applicant (for US only): JENSEN, Niels, Jørgen [DK/DK]; S.J. Hvarregaardsvej 13, Hune, DK-9492 Blokhus (DK). (74) Agent: HOFMAN-BANG & BOUTARD, LEHMANN & REE A/S; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>

(54) Title: A HANDHELD APPARATUS HAVING ANTENNA MEANS FOR EMITTING A RADIO SIGNAL, A HOLDER THEREFOR, AND A METHOD OF TRANSFERRING SIGNALS BETWEEN SAID APPARATUS AND HOLDER

(57) Abstract

A handheld apparatus (11), which comprises antenna means for emitting a radio signal, comprises at least two antennas (9, 14) which have different radiation characteristics. The apparatus comprises a shield (3) which surrounds some of the electronic components (2) of the apparatus and consists of an insulating material (4) metallized on the side facing away from the components as well as on the side facing the components. At least part of the metallization (5) facing away from the components constitutes a patch antenna (9) which is adapted to transmit and/or receive said radio signals. A holder (20) for a handheld apparatus (11), which is provided with a patch antenna (9) and is adapted to emit radio signals, comprises a patch antenna (19) adapted to cooperate with the corresponding patch antenna (9) on an apparatus placed in the holder. In a method of transferring radio signals between such a handheld apparatus (11) and a radio installation fixedly mounted in a vehicle, the signals are transferred between two patch antennas (9, 19) which are placed in said apparatus and a holder (20) therefor, respectively.



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A hand-held apparatus having antenna means for emitting a radio signal, a holder therefor, and a method of transferring signals between said apparatus and holder

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The invention relates to a hand-held apparatus comprising antenna means for emitting a radio signal, and to such an apparatus comprising a shield which consists of an insulating material and surrounds some of the electronic components of the apparatus, and which is metallized on the side facing away from the components as well as on the side facing the components in order to shield radio frequency signals. The invention moreover relates to a holder for a hand-held apparatus, provided with a patch antenna, for emitting radio signals, and to a method of transferring radio signals between such an apparatus and a radio installation fixedly mounted in a vehicle.

In e.g. modern mobile telephone systems the portable transmitter and receiver units are usually provided with antennas which have an omnidirectional radiation diagram, as this gives the greatest possible probability that a connection is established to the mobile telephone concerned at a given time, thereby facilitating the system planning of the system operators. Of course, also the users of the mobile telephones wish that the system has a coverage as good as possible.

The omnidirectional radiation diagram, however, has the drawback that the telephone will usually be arranged in such a manner with respect to a user's head that the head is present precisely where the electrical field from the antenna of the telephone is strongest. This means that a certain power loss will occur, as part of the radiation energy dissipates in the head, and also involves the risk that precisely this energy dissipation may constitute a

health hazard. Because of the possible health hazard in particular, it is therefore desired that the radiation should be directed away from the user's head.

5 A proposal for the solution of this problem is known from WO 94/22235, in which a shield element is arranged between the antenna and the user's head. The shield element is intended to absorb, block or reflect the electromagnetic radiation from the antenna. In an alternative embodiment, the shield is an integral part of the antenna
10 itself. However, this solution has the drawback that with the radio frequencies used, which may e.g. be 900 MHz or 1.8 GHz, the extent of the shield in the longitudinal direction is of the same order as the wavelength, which
15 will reduce the effect of the shield since its outermost end will act as an antenna to some extent. Since, in this solution, the radiation is mainly directed away from the user's head, the transmission/reception conditions of the telephone will moreover be impaired, unless a base station
20 is present precisely in this direction. Therefore, the solution is useful only in areas where the base stations are located so close to each other that there will always be a sufficiently close base station in the direction concerned.

25

Another solution is known from WO 95/24746. Here, a so-called inverted F-antenna is placed on the rear side of the telephone so that the free end of the telephone is present at the end of the telephone which is positioned
30 against the user's ear in use. This means that here too the radiation from the antenna is mainly directed away from the user's head, and the solution therefore makes the same requirements with respect to the locations of the base stations as described above.

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It is also known to provide a mobile telephone with two different antennas. US 5 530 919, e.g., describes an apparatus which has a built-in directional antenna and a rod antenna. The directional antenna is used as a transmitter antenna and the rod antenna as a receiver antenna. This apparatus, too, therefore relies on the presence of a base station in the direction in which the directional antenna is oriented, as the apparatus can only transmit in this direction. On the other hand, the rod antenna enables reception from all directions.

Also EP 214 806 describes an apparatus with a built-in directional antenna and a rod antenna. Both antennas are used here as receiver antennas in order to obtain receiver diversity, while only the rod antenna is used as a transmitter antenna. Thus, this apparatus does not avoid radiation into the user's head.

Accordingly, an object of the invention is to provide a solution which, under poor transmission/reception conditions, is capable of transmitting and receiving with a quality which corresponds to the normal mobile telephones having omnidirectional radiation characteristic, while exposing the user's head to the least possible radiation risk.

This is achieved according to the invention in that the hand-held apparatus for emitting a radio signal comprises at least two transmitter antennas which have different radiation characteristics.

Consequently, it is possible to use one or both antennas depending on the reception conditions. It may be ensured in this manner that the user's head is exposed to radiation only when this is necessary owing to the transmission/reception conditions.

This is possible in particular when one transmitter antenna, as stated in claim 2, has an omnidirectional radiation characteristic, and the other has a directional radiation characteristic. The antenna having omnidirectional radiation characteristic is then used only when it is necessary owing to the transmission/reception conditions.

In an expedient embodiment of the invention, which is defined in claim 3, the antenna having omnidirectional radiation characteristic is a telescoping antenna, while the antenna having directional radiation characteristic is a patch antenna.

The telescoping antenna may be adapted to be connected only when it is extended fully or partly, as stated in claim 4. Hereby, it is the user himself who decides whether the transmission/reception conditions are so poor that it is necessary to connect the telescoping antenna.

Alternatively, as stated in claim 5, the apparatus may comprise means for connecting and disconnecting the telescoping antenna in response to a received signal. This may take place e.g. in that a base station, when it is difficult for it to receive the signal emitted from the apparatus, requests the apparatus to connect the telescoping antenna. Another possibility, which is defined in claim 6, is that the apparatus comprises means for measuring the field strength of a signal received on the patch antenna, and that the telescoping antenna is adapted to be connected only when said field strength is below a specific value, the received signal level being then used as an indicator of whether the transmitted signals are sufficiently strong in a direction toward the base station. This is possible since the apparatus nor-

mally transmits to and receives from one and the same base station.

Particularly as regards mobile telephones, a small and handy size is of great importance, and this therefore makes it necessary that the two antennas must be capable of being integrated in the apparatus without this adding considerably to the size of it. Since the omnidirectional antenna is already included in the design of most existing apparatuses, this means that it must be possible to incorporate the directional antenna without changing the design of the apparatus considerably.

The above-mentioned US 5 530 919 discloses an apparatus which has an incorporated antenna and a shield which is disposed between the antenna and the user's head. However, they are two separate components which therefore still take up some space. Accordingly, a further object of the invention is to provide an apparatus having a built-in patch antenna which takes up less space than in the known devices.

This is achieved, when the apparatus, as stated in claim 7, comprises a shield which surrounds some of the electronic components of the apparatus and consists of an insulating material metallized on the side facing away from the components as well as on the side facing the components, in that at least part of the metallization facing away from the components constitutes a patch antenna which is adapted to transmit and/or receive said radio signals.

Typically, devices of this type will be provided with a shield against radio frequency signals. It will usually be a metallized plastics shield which is metallized on both sides for reasons of production, so that in fact it

is a double shield. When the outer side of the shield (or part thereof) is used as a patch antenna, the inner side of the shield can still serve the function of a shield against radio frequency signals, as stated in claim 8, while constituting the ground plane associated with the patch antenna.

Since the radiation diagram from such a patch antenna will be very directional, the desired radiation diagram is achieved in that the patch antenna, like in claim 9, is disposed on the side of the apparatus which, when used by a person, faces away from the person. For a mobile telephone, this will be the rear side of the telephone. The directional effect is achieved because the other metal parts and printed circuit boards of the telephone perform a shielding effect toward the person.

When hand-held devices for the emission of radio signals, such as e.g. portable mobile telephones, are used in cars, the telephone is frequently connected to an antenna on the roof of the car in order to increase the range of the telephone. The transport of radio frequency signals between the car telephone and the external antenna of the car usually takes place via coaxial cables, typically in that the telephone has a coaxial connector in the bottom to which the external antenna of the car is connected. In practice, this is inexpedient, however, as the coaxial connectors concerned are relatively expensive and also rather fragile and thus subjected to wear.

When, as stated in claim 10, a holder for such an apparatus is provided with a patch antenna which is adapted to cooperate with the corresponding patch antenna on an apparatus placed in a holder, it is ensured that the radio frequency signals can be transferred wirelessly between

the two patch antennas, thereby avoiding the use of coaxial connectors.

When, moreover, as stated in claim 11, the holder comprises means for ensuring a specific position of the two patch antennas with respect to each other when an apparatus is placed in the holder, the best possible transfer of signals is obtained between the two patch antennas, as these will be positioned in the same manner with respect to each other each time.

Finally, the invention relates to a method of transferring radio signals between a hand-held apparatus and a radio installation fixedly mounted in a vehicle, comprising transferring the signals between two patch antennas which are placed in the apparatus and a holder therefor, respectively.

The invention will now be explained more fully below with reference to the drawing, in which

fig. 1 shows part of a circuit in an existing mobile telephone,

fig. 2 shows the structure of a patch antenna according to the invention,

fig. 3 shows the radiation from a mobile telephone having a patch antenna according to the invention,

fig. 4 shows the radiation from a mobile telephone having a patch antenna as well as an activated telescoping antenna,

fig. 5 shows a block diagram for an alternative embodiment of the invention, and

fig. 6 shows a mobile telephone placed in a specially adapted holder having a path antenna.

It is shown in fig. 1 how part of the circuit in existing mobile telephones may be designed. A printed circuit board 1 mounts a plurality of electronic components 2, and owing to incident and emanating radiation of radio frequency signals the components are surrounded by a shield 3, which typically consists of a plastics material 4 provided with a metallization 5, 6 on both sides. Metallization on one of the sides will normally be sufficient to perform the shielding function; but, generally, the shield will be metallized on both sides for reasons of production. This means that the metallization on the outer side may be used for other purposes.

It is shown in fig. 2 how this may be utilized for a patch antenna according to the invention. The metallization 6 is still present on the inner side of the plastics material 4, while the metallization 5 from fig. 1 on the areas 7 and 8 is removed. The metallization constitutes a patch antenna 9 on the central part of the outer side. This patch antenna, inter alia because of the shielding metallization 6, will particularly radiate radio frequency signals in a direction away from the plastics material 4 and thereby away from the components 2. The printed circuit board 1 itself and the other metal parts of the telephone will provide a further shielding effect in the opposite direction. Fig. 3 shows that when the shield 4 with the patch antenna 9 is placed on the rear side 10 of a telephone 11, a radiation diagram is obtained where the radiation 12 is directed away from the person 13 who uses the telephone. It will be seen that the telephone 11 is also provided with a rod antenna 14 which, in this situation, is not connected and therefore does not emit radio signals.

As appears from fig. 4, the rod antenna 14 may be arranged as a telescoping antenna which is connected only when it is extended. In that case, it has an omnidirectional radiation diagram, which means that when it is extended, the telephone 11, generally speaking, emits (and receives) radio signals equally well in all directions, and thus also in the direction of the person 13. The idea is thus that in areas having sufficient radio coverage, the radiation 12 from the patch antenna 9 will be sufficient to ensure connection, as there will usually be a sufficiently close base station in the direction of the radiation 12. The telescoping antenna 14 may thus be retracted and thereby be disconnected. Then, the person 13 will not be exposed to the strong radiation from the telephone. This corresponds to the situation shown in fig. 3.

In areas where the radio coverage is not good enough for this, the antenna 14 may then be extended and thereby connected so that the telephone 11 has the omnidirectional radiation diagram with the radiation 15. In this situation, which corresponds to fig. 4, the person 13 is exposed to radiation in the same manner as in ordinary mobile telephones which are just provided with an omnidirectional antenna; but, as mentioned, this will just be the case where the radio coverage is not very good. In practice, the radio coverage in urban areas will usually be sufficient for the situation in fig. 3 to be used, thereby avoiding exposing the person to the incident radiation, while outside the urban areas it will typically be necessary to supplement with the telescoping antenna and the associated incident radiation of radio energy. For the great majority of subscribers, the radiation to which they are exposed will thus be reduced considerably.

In the embodiment described above, the omnidirectional antenna 14 is thus connected in that the user himself extends it when the transmission/reception conditions so require. Fig. 5 shows a block diagram for an alternative embodiment. The signal to and from the antenna 4 is here connected to the transmitting/receiving circuit 16 of the telephone via a switch 17. A detecting circuit 18 can measure the field strength of a signal received on the patch antenna 9 and control the switch 17 in response thereto. If the field strength is above a predetermined threshold value, the connection between the antenna 14 and the transmitting/receiving circuit is disconnected, while, correspondingly, this connection is established when the field strength of the received signal is below this threshold value. Thus, the antenna 14 is connected only when the signal received on the patch antenna 9 is too low to ensure a good connection. Since transmission takes place to one and the same base station, the signal received will frequently be a sufficiently good indicator of whether the emitted signal is sufficiently strong. If, in this situation too, the antenna 14 is a telescoping antenna, the full effect of this principle is achieved only if the antenna is extended, of course.

Alternatively, a special signal may be transmitted from the base station to the telephone if the signal received therefrom is too weak, and the detecting circuit 18 may then be adapted to receive this signal and control the switch 17 in response thereto. Hereby, it will be the signal received on the base station that decides whether it is necessary to connect the omnidirectional antenna 14.

With the patch antenna, described above, on the rear side of the telephone, it is also possible to obtain a much simpler connection to an external antenna in e.g. a car

than has been possible in the past. An external antenna on e.g. the roof of the car is used for increasing the range of the telephone. Till now, the transfer of the radio frequency signals between the mobile telephone and the external antenna has usually taken place by means of coaxial cables, as the telephone e.g. has a coaxial connector in the bottom to which the external antenna may be connected.

10 According to the invention, however, the coaxial cables may be replaced by two patch antennas arranged opposite to each other, as will be seen in fig. 6. The holder 20, also called cradle, of the telephone is provided with a patch antenna 19 whose size corresponds to the size of
15 the patch antenna 9 in the telephone, and which is arranged so that it will be right opposite it when the telephone is placed in the holder. The patch antenna 19 is connected to the external antenna by means of the cable 21. The holder 20 may moreover be provided with
20 e.g. guide rails capable of ensuring that a telephone is always placed in the holder such that the two patch antennas are right opposite each other and at a well-defined distance from each other.

25 The radio frequency signals are thus transferred wirelessly between the two patch antennas. This means that the coaxial connectors may be saved, while obtaining a solution which is not subjected to wear, as is the case with the coaxial connectors.

30 Although a preferred embodiment of the present invention has been described and shown, the invention is not restricted to it, but may also be embodied in other ways within the subject-matter defined in the following patent
35 claims.

P a t e n t C l a i m s :

1. A hand-held apparatus (11) which comprises antenna
5 means for emitting a radio signal, c h a r a c t e r -
i z e d in that it comprises at least two transmitter
antennas (9, 14) which have different radiation charac-
teristics.
- 10 2. An apparatus according to claim 1, c h a r a c -
t e r i z e d in that a first one (14) of the at least
two transmitter antennas has an omnidirectional radiation
characteristic, and that a second one (9) of the at least
15 two transmitter antennas has a directional radiation
characteristic.
3. An apparatus according to claim 2, c h a r a c -
t e r i z e d in that the antenna having omnidirectional
radiation characteristic is a telescoping antenna (14),
20 and that the antenna having directional radiation charac-
teristic is a patch antenna (9).
4. An apparatus according to claim 3, c h a r a c -
t e r i z e d in that the telescoping antenna (14) is
25 adapted to be connected only when it is extended fully or
partly.
5. An apparatus according to claim 3, c h a r a c -
t e r i z e d in that it comprises means (17) for con-
30 necting and disconnecting the telescoping antenna (14) in
response to a received signal.
6. An apparatus according to claim 5, c h a r a c -
t e r i z e d in that it comprises means (18) for meas-
35 uring the field strength of a signal received on the
patch antenna (9), and that the telescoping antenna (14)

is adapted to be connected only when said field strength is below a specific value.

7. A hand-held apparatus (11) for emitting radio signals and comprising a shield (3) which surrounds some of the electronic components (2) of the apparatus and consists of an insulating material (4) metallized on the side facing away from the components as well as on the side facing the components, characterized in that at least part of the metallization (5) facing away from the components constitutes a patch antenna (9) which is adapted to transmit and/or receive said radio signals.

8. An apparatus according to claim 7, characterized in that the metallization (6) facing the components is adapted to shield radio frequency components.

9. An apparatus according to claim 7 or 8, characterized in that the patch antenna (9) is placed on the side (10) of the apparatus which, when used by a person (13), faces away from the person.

10. A holder (20) for a hand-held apparatus (11) for emitting radio signals, said apparatus being provided with a patch antenna (9), characterized in that the holder comprises a patch antenna (19) which is adapted to cooperate with the corresponding patch antenna (9) on an apparatus placed in the holder.

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11. A holder according to claim 10, characterized in that it moreover comprises means for ensuring a specific position of the two patch antennas (9, 19) with respect to each other when an apparatus is placed in the holder.

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12. A method of transferring radio signals between a hand-held apparatus (11) for emitting such radio signals and a radio installation fixedly mounted in a vehicle, characterized in that the signals are transferred between two patch antennas (9, 19) which are placed in said apparatus and a holder (20) therefor, respectively.

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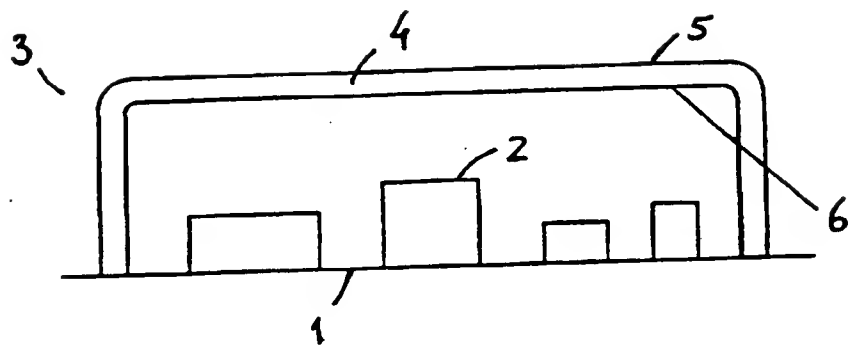


Fig. 1

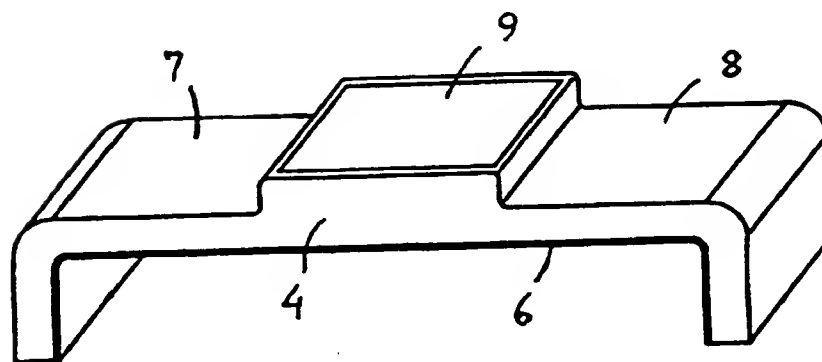


Fig. 2

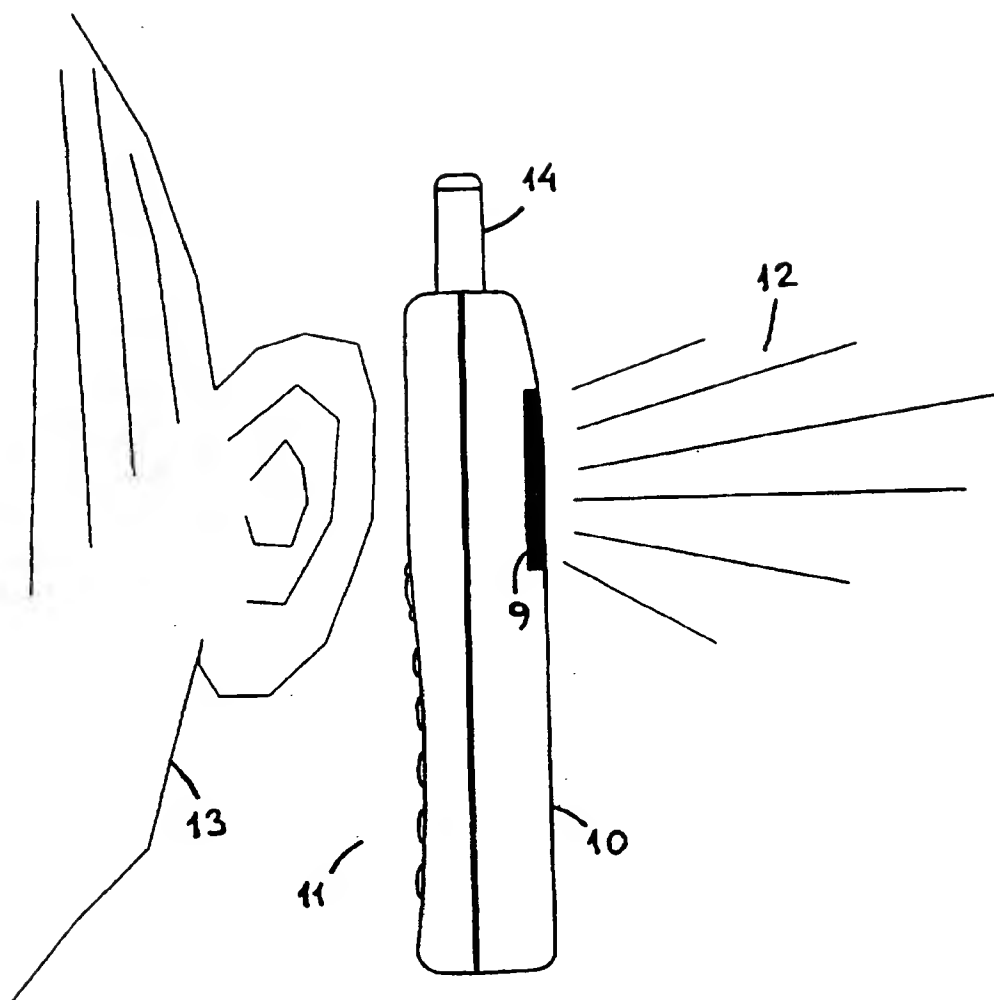


Fig. 3

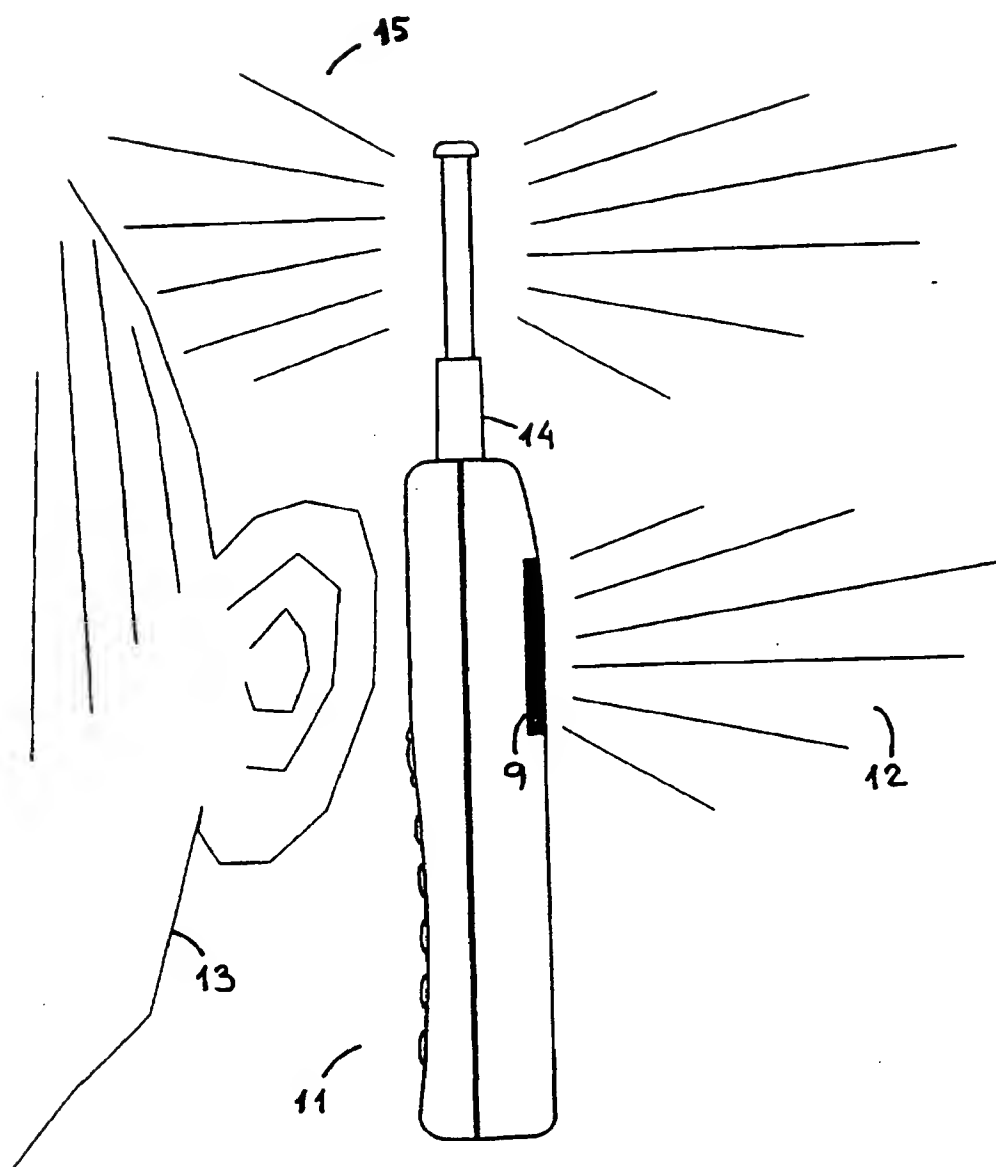


Fig. 4

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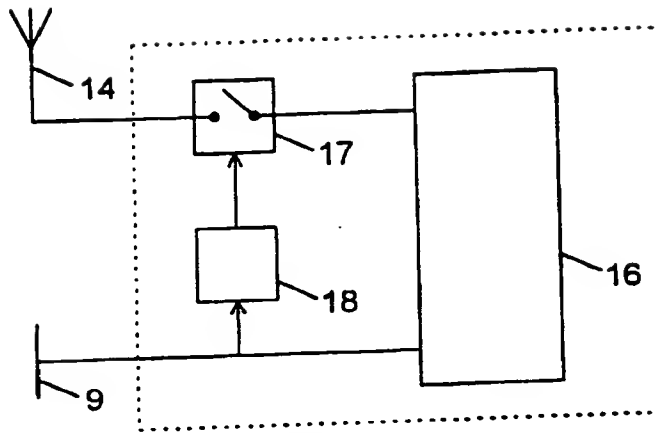


Fig. 5

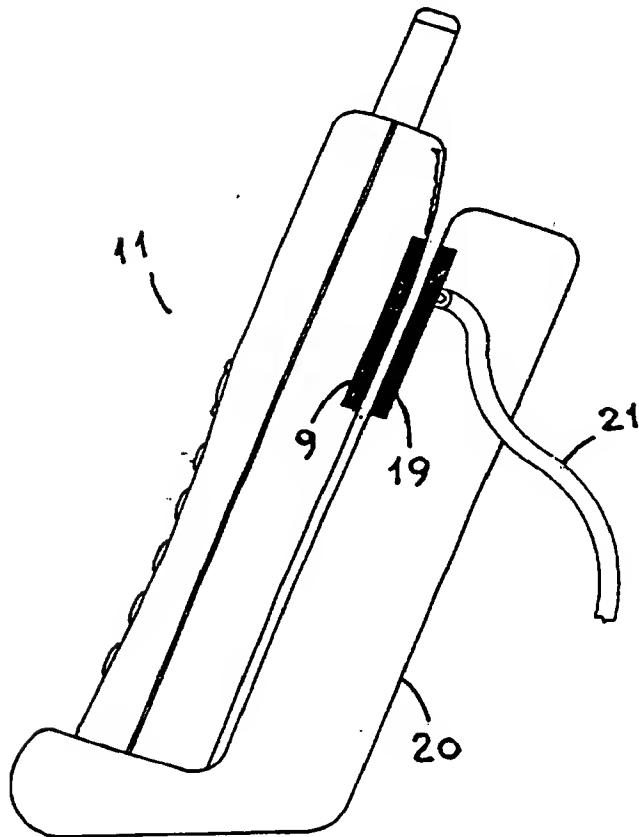


Fig. 6

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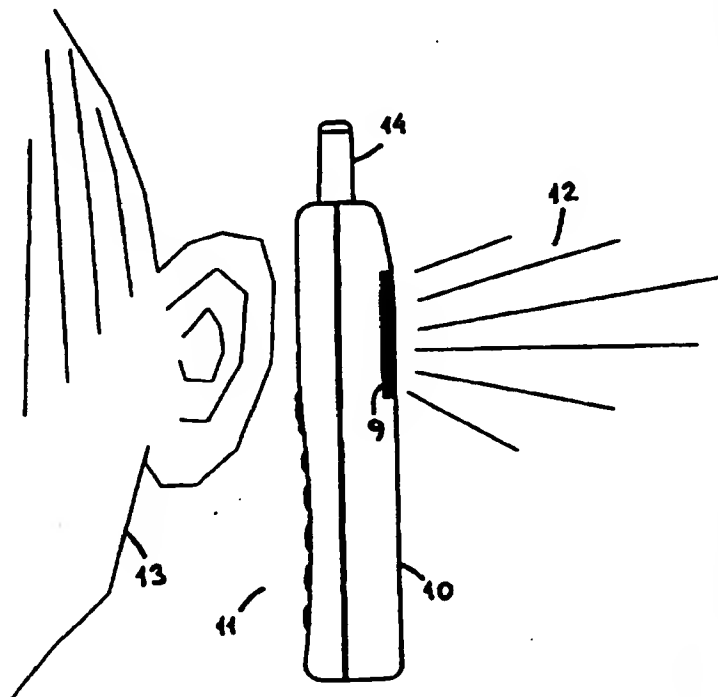
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(57) Abstract

A handheld apparatus (11), which comprises antenna means for emitting a radio signal, comprises at least two antennas (9, 14) which have different radiation characteristics. The apparatus comprises a shield (3) which surrounds some of the electronic components (2) of the apparatus and consists of an insulating material (4) metallized on the side facing away from the components as well as on the side facing the components. At least part of the metallization (5) facing away from the components constitutes a patch antenna (9) which is adapted to transmit and/or receive said radio signals. A holder (20) for a handheld apparatus (11), which is provided with a patch antenna (9) and is adapted to emit radio signals, comprises a patch antenna (19) adapted to cooperate with the corresponding patch antenna (9) on an apparatus placed in the holder. In a method of transferring radio signals between such a handheld apparatus (11) and a radio installation fixedly mounted in a vehicle, the signals are transferred between two patch antennas (9, 19) which are placed in said apparatus and a holder (20) therefor, respectively.



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CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 97/00295

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H01Q 1/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0451623 A1 (NOKIA MOBILE PHONES LTD.), 16 October 1991 (16.10.91), abstract ---	1-4
Y	EP 0214806 A2 (NEC CORPORATION), 18 March 1987 (18.03.87), abstract ---	1-4
X	EP 0017037 A1 (SIEMENS AKTIENGESELLSCHAFT), 15 October 1980 (15.10.80), abstract ---	1,2
A	US 5530919 A (TERUHISA TSURU ET AL), 25 June 1996 (25.06.96), column 1, line 16 - line 24; column 2, line 7 - line 24 ---	1-9

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

6 December 1997

Date of mailing of the international search report

30 -01- 1998

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 97/00295

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3241149 A (J. BERGER), 15 March 1966 (15.03.66), figure 3B --	3-4
X	WO 9422235 A1 (DANIELS, JOHN, J), 29 Sept 1994 (29.09.94), claims 13-25 --	7-9
X	US 4876709 A (MAX W. ROGERS ET AL), 24 October 1989 (24.10.89), abstract --	10-12
A	US 4661992 A (OSCAR GARAY ET AL), 28 April 1987 (28.04.87), abstract -- -----	10-12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK97/00295

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-6 comprising an antenna configuration of at least two antenna elements to get directional characteristic.
2. Claims 7-9 comprising a shield that includes an antenna.
3. Claims 10-12 comprising a wireless transmission between a portable phone and a holder, and a method thereof.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

07/01/98

International application No.

PCT/DK 97/00295

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0451623 A1	16/10/91	US 5138329 A	11/08/92
EP 0214806 A2	18/03/87	AU 598743 B	05/07/90
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		CA 1262562 A	31/10/89
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		DE 4491705 T	07/12/95
		EP 0669060 A	30/08/95
		GB 9509910 D	00/00/00
		US 5335366 A	02/08/94
		WO 9531048 A	16/11/95
US 4876709 A	24/10/89	CA 1310147 A	10/11/92
		JP 1835235 C	11/04/94
		JP 2094856 A	05/04/90
		JP 6053880 A	25/02/94
US 4661992 A	28/04/87	NONE	